

107522389
Rec'd PCT/PTO 25 JAN 2005

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
5 February 2004 (05.02.2004)

PCT

(10) International Publication Number
WO 2004/011635 A1

(51) International Patent Classification⁷: C12N 9/00, 9/12, 9/10, C12P 19/42

(21) International Application Number: PCT/EP2003/008216

(22) International Filing Date: 25 July 2003 (25.07.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data: 02255203.8 25 July 2002 (25.07.2002) EP

(71) Applicant (for all designated States except US): DSM IP ASSETS B.V. [NL/NL]; Het Overloon 1, NL-64111 TE Heerlen (NL).

(72) Inventors; and

(75) Inventors/Applicants (for US only): PEL, Herman, Jan [NL/NL]; Eikenstraat 75, NL-1326 AH Almere (NL). HOPPER, Sylvia [DE/DE]; Lochhamer Str. 11, 82152 Martinsried (DE).

(74) Agents: WRIGHT, Simon, Mark et al.; J.A. Kemp & Co, 14 South Square, Gray's Inn, London WC1R 5JJ (GB).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 2004/011635 A1

(54) Title: GENES FROM PROPIONIBACTERIUM FREUDENREICHII ENCODING ENZYMES INVOLVED IN VITAMIN B12 BIOSYNTHESIS

(57) Abstract: Four new genes, and the enzymes that they encode, are disclosed, which are present in *Propionibacterium freudenreichii*, and which are involved in at least five steps in the biosynthetic pathway of vitamin B₁₂. The four enzymes are: A: cobyrinic acid a, c-diamide synthase; B: a bifunctional enzyme, which is a cobinamide kinase and a cobinamide phosphate guanyl transferase; C: a cobalamin 5-phosphate synthase; and D: an adenosyl transferase. Genes encoding the four enzymes can be placed in *Propionibacterium* shuttle vectors and used to transform *Propionibacterium* hosts, in order to improve the production of vitamin B₁₂ or a precursor thereof on an industrial scale during fermentation.